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December 6, 2004

REMARKS

It is respectfully submitted that the new claims presented in this preliminary amendment are allowable over the references cited by the Examiner, either when taken alone or in any purported combination thereof, for a number of different reasons. Set forth hereinafter is an analysis as to some of the reasons why the new claims are allowable over the prior art of record that was cited by the Examiner in previous prosecution.

No Prior Art Reference Of Record Teaches Obtaining In-Focus A-Scans For Any Given Volume Of A Microelectronic Sample

It is respectfully submitted that the new claims are allowable over the Hashimoto '604, Hashimoto '118, Olstad et al., Shokrollahi et al. and DePetrillo references for a number of different reasons. As one example, none of these references teach or suggest the portions of the new claims that require a transducer to collect data regarding "acoustic impedance features present" within any "given volume defined inside" of a "microelectronic sample." This is accomplished, in accordance with the new claims, by causing a transducer to emit an ultrasonic pulse at "a plurality of three-dimensionally varied points located within a given volume that is defined inside of the microelectronic sample," and by causing the transducer to have, for each pulse, a focal point that is "disposed at the same location within the given volume of the microelectronic sample as the corresponding one of the three dimensionally varied points."

The claim elements, when properly interpreted, read on, for example, transducer 102 that is shown in Figure 16 of the subject application. In accordance with this exemplary embodiment of the invention, the transducer 102 is used to gather, for example, acoustic impedance

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information within any given volume defined inside of a microelectronic sample, wherein an in-focus A-scan is obtained for every interrogated point inside of the microelectronic sample. One example of this is shown in Figure 20, which illustrates three in-focus A-scans that are obtained for points (X3,y10,z5), (x1, y20,z10) and (x4,y40,z3) that are disposed within a particular volume defined inside of a microelectronic sample.

The Hashimoto '604, Hashimoto '118, Olstad et al., Shokrollahi et al. and DePetrillo references, which are all of the primary references cited by the Examiner in the Office Action, do not teach suggest this subject matter (e.g. obtaining "in-focus A-scans" for a plurality of three-dimensionally varied points inside a microelectronic sample). An analysis with respect to each of these primary references follows.

The DePetrillo Reference

The DePetrillo reference purports to teach a "novel method of die crack inspection of a plastic encapsulated integrated circuit" which uses "a scanning acoustic microscope" as stated in its abstract. However, the DePetrillo reference does not teach or suggest that, for example, an in-focus A-scan can be obtained for a plurality of three dimensionally varied points within any given volume inside a microelectronic sample. One reason for this is that this reference teaches that, in order to obtain a C-scan of a "die subsurface," a data gate is moved to cover only the subsurface region. This *does not* allow the creation of in-focus A-scans for points within any given volume defined inside of a microelectronic sample as required by the new claims. Rather, moving a data gate merely allows *out of focus* data to be obtained regarding subsurface features.

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Accordingly, the new claims define patentable subject matter over the DePetrillo reference.

The Shokrollahi Reference

The summary of the invention of the Shokrollahi reference states an object of the invention disclosed therein is to produce "high resolution ultrasound images of biological tissue substantially free of speckle." This reference has absolutely nothing to do with the creation of acoustic reflectance data that comprises in-focus A-scans at a plurality of three-dimensionally varied points within any given volume defined inside of a microelectronic sample. There is no teaching or suggestion within the reference that the invention disclosed therein can be used in micro-imaging applications in accordance with the claimed invention. For these reasons, it is respectfully submitted that the new claims define patentable subject matter over the Shokrollahi et al. reference.

The Olstad Reference

The Olstad reference purports to teach a method for generating anatomical m-mode displays in ultrasonic investigation of living biological structures during movement. The m-mode scanning apparatus disclosed in Olstad has absolutely nothing to do with the subject matter of the new claims, which requires the creation of acoustic reflectance data that comprises in-focus A-scans at a plurality of three-dimensionally varied points within any given volume defined inside of a microelectronic sample. There is no teaching or suggestion within the reference that the invention disclosed therein can be used in micro-imaging applications in accordance with the claimed invention. For these reasons, it is respectfully submitted that the

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new claims defined patentable subject matter over the Olstad reference.

The Hashimoto '118 Reference

The claims in this application have been amended to require the creation of acoustic reflectance data that comprises in-focus A-scans at a plurality of three-dimensionally varied points within any given volume defined inside of a microelectronic sample. The Hashimoto '118 reference contains no teaching or suggestion that the invention disclosed therein can be used in micro-imaging applications in accordance with the claimed invention. As such, it is respectfully submitted that the new claims defined patentable subject matter over the Hashimoto '118 reference for this reason alone.

Moreover, the Hashimoto '118 reference teaches the use of an ultrasonic probe that has a "two-dimensional array shape having a plurality of ultrasonic wave elements laid out in a matrix." Such transducers generally cannot be used to obtain acoustic reflectance data for a desired set of points within any given volume of a microelectronic sample because, for example, they are generally too large to be coupled to a microelectronic sample. For this additional reason, it is respectfully submitted that the new claims define patentable subject matter over the Hashimoto '118 reference.

The Hashimoto '604 Reference

The Hashimoto '604 reference is significantly different from the new claims for at least two different reasons. First, Hashimoto '604 concerns the use of B-mode image data, not the creation of in-focus A-scans at any point within a given volume of a sample. Second, Hashimoto

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'604 is directed to preventing a "blood image" from "being formed in front of a tumor image" and, therefore, concerns imaging human tissue as opposed to creating acoustic reflectance data regarding acoustic impedance features within any given volume inside a microelectronic sample. For at least these two reasons, the new claims defined patentable subject matter over the Hashimoto '604 reference.

The Ishibashi Reference

The Ishibashi reference differs from the subject matter of the new claims for at least two reasons. First, Ishibashi is directed towards the use of B or C mode scanning as opposed to A-mode scanning as is required by the present invention. Second, the Ishibashi reference is specifically limited to obtaining *out of focus* acoustic reflectance data regarding the inside of a sample. One reason for this is set forth in Ishibashi's summary of the invention, where it is stated that "3D image scanning of a sample can be attained by a single 2D scanning." Thus, the z-data necessarily is out of focus at points within the volume of the sample other than in the particular plane where the beam is focused. This is in direct contrast to the new claims which require that acoustic reflectance data comprising an in-focus A-scan for each one of a plurality of points within any given volume defined inside a microelectronic sample. For these reasons, for example, the new claims define patentable subject matter over the Ishibashi reference.

The Nigam Reference

The Nigam reference (U.S. Patent No. 4,043,181) relates to an apparatus with a signal processing circuit for compensating for attenuation effects caused by ultrasound absorption,

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diffraction, reflection and scattering. Nowhere does the Nigam reference disclose focusing an ultrasonic pulse at three dimensionally varied locations within a given sample volume. Nigam also does not appear to include a memory for storing A-Scans and the ability to reconstruct in focus images at any of a plurality of three dimensionally varied locations in the sample.

The Examiner asserts that Nigam can be combined with one or more of the body-part macroimaging primary references. However, even if true, at best Nigam would accomplish signal gain compensation or correction for whatever attenuation effects are present in those other references. Nigam, does not however, supply the missing elements of those references that would be necessary to render obvious the present invention. Nor does Nigam teach how those references could be modified to render obvious the invention as presently claimed.

Hindsight Reconstruction

As an additional matter, the Examiner's attention is drawn to the fact that one of ordinary skill in the relevant art would understand that micro-imaging is a field of art that is fundamentally different from macro-imaging. That person also would understand that A-mode scans are fundamentally different from other scans such as B, C or M mode scans. Although the present invention contemplates reconstructing multiple A-Scans in a given horizontal plane into a C-Scan image and reconstructing multiple A-Scans in a given vertical plane into a B-Scan image, this is distinct from a planar scan in B-mode or C-mode. As such, it is respectfully submitted that no legitimate basis exists to combine a micro-imaging reference, such as DePetrillo, with a

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macro-imaging reference, such as Olstad et al. Without another reference that provides such a basis, it is respectfully submitted that the Examiner would be relying on the teachings of the subject application to make such a purported combination of references, which, as the Examiner surely is aware, is improper hindsight reconstruction.

Closing

In view of the foregoing, it has been established that no reference of record, either taken alone or in a purported combination of references, teaches or suggest the subject matter of the new claims presented in this preliminary amendment. As such, it is respectfully submitted that the new claims are in condition for allowance and, therefore, a formal notice to that effect is earnestly solicited.

The Examiner's attention is drawn to the fact that an information disclosure statement was filed with the RCE request. The references disclosed in the IDS are believed to be cumulative of, for example, the DePetrillo reference. In any event, the Examiner is respectfully requested to consider these references, and to make them of record.

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It is respectfully submitted that the new claims presented in this preliminary amendment are in condition for allowance. Therefore, a formal notice to that effect is earnestly solicited. The Examiner is requested to contact the undersigned attorney by telephone prior to issuing any Office Action in response to this preliminary amendment. The Examiner's cooperation in this regard would be highly appreciated.

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Respectfully submitted,
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